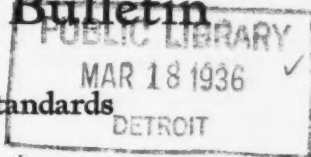


Technical News Bulletin

of the
National Bureau of Standards

★ Issued Monthly ★



Washington

MARCH 1936

Number 227

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MEETING OF FEDERAL FIRE COUNCIL

On January 31 Dr. Lyman J. Briggs, Director of the National Bureau of Standards, presided over a meeting of the Federal Fire Council in the Commerce Building, at which 30 representatives from Government departments and establishments were present.

A report was presented on surveys of the buildings of the National Agricultural Research Center at Beltsville, Md. Ten groups of important buildings and numerous smaller structures are scattered over a tract of 5,000 acres. Some of these house valuable plants and stock, developed as the result of painstaking research. Their loss, if not irreparable, would set back the work by many years.

Recommendations were made for reducing hazards from heating and refrigeration, for increasing the water supply for fighting fire, and for the installation of hydrants, standpipe and hose, manual and automatic fire-alarm equipments and automatic sprinklers. Provisions for a fire engine and the organization of a fire company were also given consideration.

Another report dealt with the establishment of fire resistance standards for the design of Federal buildings by

the Office of the Supervising Architect. During the past year such standards were set up for buildings of the post office; combined post office and court house; and general office accommodation types, in cost classifications up to \$500,000. The plans of the new building for the Department of the Interior have also been reviewed.

Another group (which reports to the Treasury Department and has been assisted in its work by members of the Federal Fire Council) gave an account of surveys and of improvements already made or planned for the Treasury Building, the Treasury Annex Building, and the Wilkins Building. The Coast Guard occupies the last-named structure. The council decided to undertake in the near future an inquiry into the general fire-hazard conditions in the new Government buildings in Washington. Points to be considered are: Occupancies and equipment, control exercised in the allotment of space, provisions for periodic inspections, fire-protection equipment (whether manual or automatic), and methods of fire extinguishment that will result in the least damage to building trim, decorations, and contents.

K₂O-PbO-SiO₂ GLAZES AND GLASSES

Compositions containing only potassium oxide, lead oxide, and silica were studied as glasses during the course of the determination of phase equilibria in the system of these oxides (Technical News Bulletin 224, December 1935).

Glasses in that portion of the ternary diagram lying on the silica side of the tie lines connecting the compound compositions K₂O.4SiO₂, K₂O.PbO.4SiO₂, K₂O.4PbO.8SiO₂, and PbO.SiO₂ are stable in air. Compositions in this area and near these tie lines fuse to a homogeneous glass with sufficient ease to be of possible commercial application. However, temperatures required to produce a glass, and the viscosity of the product, rise very rapidly with increase in silica. It is believed that the band or area of commercially usable compositions would be narrow. Compositions on the K₂O side of the tie lines mentioned are either unstable in air or, in that area bounded by the tie lines from PbO.SiO₂ and from PbO to K₂O.2PbO.2SiO₂, prone to devitrification. Also, nearly all compositions below a line connecting PbO with the K₂O.PbO composition separate into two immiscible liquids.

The usefulness or lack of usefulness of a composition as a glass will generally determine also its potential value as a glaze for porcelain or earthenware. In addition, a glaze must have the proper thermal dilatation to "fit" the ware upon which it forms a coating. Unfortunately, all the glasses examined, and which otherwise held promise of usefulness as glazes, on heating or cooling, undergo volume changes so high as to preclude their use on clay ware as now manufactured (with the exception of certain "high silica" and "high tale" wall tile). Typical values will be found in the following table, in which compositions are given in weight percent, and expansion in microns per centimeter from room temperature to 300° C.

K ₂ O	PbO	SiO ₂	Expansion
%	%	%	μ
-----	78.8	21.2	27
69.0	31.0	26	
6.4	60.8	37.8	28
8.9	43.5	47.6	24
11.7	28.1	60.2	23
16.9	40.0	43.1	36

BOILER-FURNACE SLAGS

The ordinary boiler-furnace slags show, on petrographic examination, various minerals in a matrix of glass. These minerals are usually mullite, anorthite, corundum, some form of silica, and iron minerals. The amounts and kinds of minerals present and the fusing temperatures depend upon the composition of the slag in question. In order to obtain a clearer idea of the mineralization likely to take place, as well as the fusing temperatures, a study is being made of the CaO-Al₂O₃-SiO₂-Fe₂O₃ system in the areas common to typical boiler-furnace slags. The temperatures, boundary lines, and compounds of the system CaO-Al₂O₃-SiO₂ being known, this system is used as the base of the tetrahedron whose apices are CaO, Al₂O₃, SiO₂ and Fe₂O₃. One portion of the level or plane obtained by adding 10 percent of Fe₂O₃ has been studied. The area centers about the join of the silica-mullite, silica-anorthite, and anorthite-mullite boundary lines. The join of the mullite-corundum boundary line with the mullite-anorthite and anorthite-corundum lines is included. In general, the boundary lines of the 10-percent-iron level follow the general direction of similar lines on the base, with a slight amount of shifting. In the area studied, iron minerals do not appear as the primary phase. The 10 percent of Fe₂O₃, however, does cause a general lowering of temperature of from 100° to 200° C, at which the primary phases appear.

Several boiler-furnace slags, whose history as to corrosion in service is known, and which contain approximately 10 percent of iron, have been plotted on the diagram by assuming all fluxes present as lime. However, in spite of the fact that fluxes other than lime are present in varying amounts, the correlation between corrosive action, as shown in service, and what might be expected from the place on the diagram, is generally fairly good. The slags near the lines and the join showing the lowest temperatures, are the most corrosive as compared to those lying in the areas of higher temperatures. The slags lying in the anorthite area are all relatively corrosive, while those lying in the mullite area may or may not be, depending on nearness to the anorthite-mullite boundary line, and particularly near the join with the silica-mullite, and silica-anorthite lines. Where the slag lies away from these areas, and especially if near the corundum area, the corrosion becomes less. Since a great many slags contain

higher percentages of iron, future work will include mixtures containing 20 percent and 30 percent of iron oxide.

COLORS AND FINISHES FOR CAST STONE

The Bureau has just issued a pamphlet entitled "Colors and Finishes for Cast Stone", Commercial Standard CS53-35. This aims to assist the writers of architectural specifications and designers of buildings by listing a series of standard samples of cast stone covering the more commonly selected finishes and colors available in that material. These particular colors and textures were selected by a committee of architects, and include rubbed, brushed, etched, and bushhammered finishes and buff and gray colors. These master samples are on file at the Bureau as standards of reference. They have been duplicated by The Cast Stone Institute for distribution to architects, manufacturers, and others concerned with the production and use of cast stone.

It is not, however, the purpose of this standard to limit the range of colors, textures, and finishes in cast stone. Under its present scope it merely sets up tangible examples of the most frequently occurring colors and finishes. These samples provide standards of comparison by which cast stone of these particular colors and finishes can be specified and judged. To the extent that they exemplify cast stone of enduring and pleasing appearance these samples provide a standard of comparison for all cast stone, regardless of color and finish.

The pamphlet includes a brief history of the project, a list of the official acceptors, and the membership of the standing committee. The standard became effective August 30, 1935. Copies are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

"SUGARING" OF MARBLE

A peculiar effect of weathering on marble buildings and monuments, which destroys the coherence of the calcite or dolomite crystals, is commonly called sugaring. This process is usually manifested by a very shallow layer of loosened crystals on the exposed surface. However, some cases have been noted where sugaring had occurred to a depth of an inch or more.

This kind of weathering has been the subject of a study at the Bureau for

some time, but until recently attempts to reproduce a similar effect in the laboratory were not successful. Marble has a high resistance to frost action but a low resistance to acids. Strong acids readily dissolve the material without destroying the coherence of the crystals. A commonly accepted theory for sugaring of marble is that acid rain water penetrates the pores of marble before the acid is neutralized and, by dissolving the binding material, causes the crystals to fall apart.

Anhydride gases existing in the air are absorbed by rain water and converted into acids. Probably the most effective of these are sulphur dioxide and carbon dioxide. Since both of these gases are readily dissolved by water it seems evident that a hard rainfall would almost completely remove these gases from the atmosphere within a few seconds, and subsequent rainfall would not be appreciably acidified. Marbles absorb water very slowly and hence it seems likely that the acidified portion of the rainfall is washed off before an appreciable amount of absorption could occur.

Specimens of limestone and marble exposed to the weather showed measurable weight losses within a month and quite appreciable losses within a year. The specimens also showed decreases in bulk density which indicated that the amount of pore space had increased. In an effort to determine the mechanism of this type of weathering, it was assumed that the anhydride gases penetrated the pores of stone during dry weather and were converted to acids therein during rains. An experiment was devised to accelerate the action over that which would occur under actual conditions. Specimens were dried, then placed in a closed vessel and the air drawn out. Sulphur dioxide was then admitted to the vessel and finally water was admitted. This cycle was repeated several times before the specimens showed appreciable change in appearance. After 25 cycles a specimen of dolomite marble sugared to a depth of 1 inch. Calcite marbles and limestones proved to be more resistant, but after 40 cycles most of the specimens began to show definite deterioration. These cracked without sugaring probably due to internal pressures arising from the accumulation of calcium sulphate within the pores.

The test seems to offer possibilities as a means of determining the relative resistance of different deposits of stone to this phase of weathering. It may

also prove of use in determining the value of preservative treatments designed to overcome the effects of weathering.

TESTS OF STEEL COLUMNS INCASED IN CONCRETE

In cooperation with the bridge department of the Port of New York Authority, the Bureau tested four carbon-steel columns incased in reinforced concrete. This type of construction is sometimes adopted to increase the strength of the columns. These particular columns were duplicates of columns TC1 and TC2 reported in J. Research NBS 15, 317 (1935) RP831, *Tests of steel tower columns for the George Washington Bridge*.

The temperatures in the column were measured during the aging of the concrete. The readings of telemeters attached to the steel members indicated that no appreciable stress in the steel members was caused by this action. When the columns were loaded, the telemeter stresses were always less than the quasi-stress obtained by dividing the load by the cross-sectional area of the steel members, showing that the concrete carried a portion of the load.

At the column yield strength, the load on the incased columns was 51 percent greater than the load on the uncased columns. At the final maximum load, the load on the incased columns was 42 percent greater than the load on the uncased columns.

The greatest stress in the reinforcement rods was 10 kips/in.²

The lateral deflection was very small until the load on the column approached the maximum. At or about the maximum load, the columns having a length of 24 feet deflected about 6 inches, and large pieces of concrete fell from the columns.

A complete report on these tests will be published in the March number of the Journal of Research (RP873).

TRANSVERSE TEST BARS OF CAST IRON

The so-called arbitration bar, which in testing is loaded transversely until failure occurs, is very widely used for specifying the properties of cast iron. The preparation of transverse test bars free from "burnt on" sand and other surface defects is important as such defects may seriously impair the transverse strength. A pitted or roughened surface, for instance, may cause early breaking of the bar by stress concentration due to the so-called notch effect. A study of molding material and

casting technique which will produce test bars free from such defects has been under way at the Bureau for some time.

A method of casting transverse test bars in green-sand molds made of a mixture of eight parts of an iron molding sand and one part of sea coal, the mold cavities being faced with a carbonaceous nongraphitic material, has been found to be very satisfactory. Test bars of various diameters cast by four different methods have been employed in testing several types of cast irons which had been heated to several maximum heating temperatures, the metal being poured approximately 300° F above the liquidus temperature. Test bars vertically cast and bottom poured were most uniform in dimensions and hence gave most consistent results. The transverse strength was found to increase with increase of the maximum heating temperature. The results will form the basis of a technical report.

CARBONYL IRON

Iron of a very high degree of purity, made by a process in which iron carbonyl is decomposed to give metallic iron and a gaseous constituent, has been enthusiastically received as a material on which the fundamental characteristics of this element can be determined. However, spectroscopic and analytical evidence obtained at this Bureau have indicated that carbonyl iron is not always so free from impurities as it has been claimed to be, and recently, determinations of the temperature coefficient of resistivity of carbonyl iron wire have given results which are not so reproducible as similar determinations on some other types of high-purity iron. This result, it is believed, can be interpreted to mean that the structure is not always uniform, and that the impurities in carbonyl iron, minute in amount as they may be, are inclined to be segregated.

DISTILLATION AND SEPARATION OF ARSENIC, ANTIMONY, AND TIN

The separation and determination of arsenic, antimony, and tin are generally considered difficult. Probably the best way of separating them from one another and from many other elements is by distillation. The errors due to the absorption of metal chlorides by, and the extraction of organic matter from the cork and rubber stoppers are avoided in apparatus described in the Journal of Research for March (RP871). Directions for the use of the apparatus are given.

ABSORPTION OF X-RAYS BY LEAD AND LEAD-BARIUM GLASSES

An investigation of the protective properties of lead and lead-barium glasses by an ionization method is described in RP870 of the March Journal of Research. Of the various glass components, it was found that only lead and barium contribute appreciably to the protective effectiveness of the glasses. Empirical relations were established between the protection coefficient of flint glass and the chemical composition, density, and refractivity of the glass. For barium flint glass an empirical relation is given between the protection coefficient and the lead-oxide and barium-oxide components.

EFFECT OF A COVER GLASS IN REFLECTANCE MEASUREMENTS

In measuring reflectance of powders, salts, liquids, jellies, and cut fibers it is fairly common practice to use a cover glass either to permit measurement when the surface is other than horizontal or to aid in the preparation of reproducible surfaces. The Bureau has found from theoretical considerations, which are explained in the March number of the Journal of Research (RP872), that the use of such a glass may result in an error of as much as 10 percent when two diffusing surfaces, one light and one dark, are compared for apparent reflectance. The error arises from multiple reflection between sample and cover glass, the light sample obtaining much more added illumination from this cause than the darker. The error depends on the angular distribution of the illuminant, the angle of view, and the diffusing characteristics of the samples, as well as on their reflectances; and, in general, the error cannot be accurately computed. On this account the avoidance of a cover glass wherever possible is recommended.

SUN LAMPS; THE CARBON ARC VERSUS SUNLIGHT

In Letter Circular LC225 of March 5, 1927, which summarized "Some Outstanding Accomplishments of the Bureau of Standards in 1926", there is included a short account of a research on the radiation emitted by the carbon-arc lamp BS Sci. Pap. 21, 535 (1926-27), in which it is stated that of all the artificial illuminants tested, the carbon arc is the nearest approach to sunlight in spectral-energy distribution.

This statement of an observation that was already known in a general

way is, of course, not an endorsement of any make of lamp by the National Bureau of Standards, yet this brief and incomplete item was seized upon for sales promotion of carbon-arc lamps. The Bureau, therefore, in Technical News Bulletin 140 (December 1928) issued a supplementary statement on *The carbon arc versus sunlight*, in which it is pointed out that while it is true that, of all the artificial sources available, the spectral radiation from the carbon arc is the closest approach to sunlight; even this source is far from being an exact match of sunlight, in spectral intensity. It contains ultraviolet radiation of very short wavelengths and infrared rays of long wavelengths which are not found in sunlight.

By covering the carbon arc with a screen of special glass it is possible to shut out the ultraviolet of short wavelengths and infrared rays of long wavelengths. Nevertheless, there remains a selective emission band of ultraviolet radiation (the "cyanogen band"), the intensity of which is far in excess of that observed in sunlight.

For some years sales-promotion literature containing quotations from LC225 has been in abeyance. Recently this incomplete statement from LC225, with no reference to Technical News Bulletin 140, has been revived in advertisements of "health lamps" and "sun lamps", with the inevitable result that this Bureau receives repeated requests regarding the reliability of the claims made for such lamps—including carbon-arc and tungsten-filament lamps.

The Bureau wishes, once more, to call attention to the fact that without an elaborate combination of filters no artificial source of radiation has yet been devised, and there is, consequently, no lamp on the market that has a spectral-energy distribution identical with that of sunlight. Moreover, in purchasing any lamp, its spectral-energy-distribution curve is not the only thing to be considered. Hazard from fire and from burns, which may result from contact with the housing of the lamp, as well as the possibility of generating disagreeable odors should all be carefully investigated.

IONOSPHERE STUDIES DURING PARTIAL SOLAR ECLIPSE

The radiation from the sun, by its effect on the ionosphere, exerts a very great influence over radio transmission. Solar eclipses offer occasional opportunities to study these changes at

times when the high-angle solar radiation is cut off rather abruptly. Investigators at the Bureau and other North American laboratories found during the eclipse of August 31, 1932, that the critical frequencies and the ionization densities of the E and F₁ regions of the ionosphere decreased during the eclipse and reached a minimum almost exactly at the eclipse maximum. These results indicated that ultraviolet light was the agent producing ionization in these two regions. No definite changes were found in the F₂ region. These results were for summer conditions for which experimental results and recent theory have indicated great diurnal temperature variations. These temperature variations complicate the changes of ionization density of the F₁ region. It was, therefore, indicated that a winter eclipse would be of special interest.

A partial solar eclipse occurred in Washington on February 3, 1935. Critical-frequency measurements of the E, F₁, and F₂ regions were made on the eclipse day and several days before and after. Ionization densities were calculated from the critical frequencies.

In the E region the ionization density was reduced to a minimum of 0.85 normal by this eclipse, during the maximum of which 0.33 of the area of the sun was obscured. Corresponding figures for the F₁ region are 0.88 normal at 0.35 area; and for the F₂ region, 0.57 normal at 0.36 area.

There was no appreciable time lag of ionization changes after the eclipse for the E region, but there appeared to be such a lag for the F₁ region. This amounted to about 20 minutes and was not very definite. There was a definite lag of ionization changes behind the eclipse for the F₂ region. The minimum ionization density occurred about 9.5 minutes after the maximum of the eclipse.

These winter results for the E and F regions agree with those obtained during the summer eclipse of 1932 in that the ionization densities decreased during the eclipse and followed approximately in phase with it. The ionization densities of these regions depended directly on solar ultraviolet radiation. The 1935 winter results for the F₂ region show that the ionization density decreased during the eclipse, but lagged a few minutes after it. These results do not agree with the summer F₂ observations, which indicated a very small or no decrease of F₂ ionization density during the summer eclipse.

This means that the total ionization of the F₂ region depends upon solar ultraviolet radiation, but the ionization densities are complicated by great temperature increases during the summer day with attendant expansion and winds in this region.

The magnitudes of the decrease of ionization densities in the E and F₁ regions indicate that when the total ionization is decreased it is by a process of recombination of positive and negative charges present. In the F₂ region the total ionization is decreased by a process of attachment of negative electrons to neutral particles.

This investigation which is fully reported in the March Journal of Research (RP868) contributes to our knowledge of the ionosphere and to an understanding of the complexities of long-distance radio-wave propagation.

NUMBER OF ATOMS IN HIGH-ENERGY STATES AND APPARENT TEMPERATURE OF CESIUM DISCHARGE

RP869 in the March number of the Journal of Research describes an investigation in which light from a tungsten-strip lamp was projected through the positive column of a cesium discharge onto the slit of a spectograph so that the lamp temperatures at which the cesium lines disappeared against the continuous background could be determined. Measurements were made on the lines 6S-6P to 6S-11P at different pressures and discharge currents. The reversal temperature was found to decrease from the first to third line, while beyond the third it remains constant. It increases with increasing current and with decreasing pressure. The number of atoms in an excited state is given by an equation of the form of the Boltzman equation with the reversal temperature replacing the equilibrium temperature. The number per cubic centimeter ranges in magnitude from 10_{11} for the first *p* state to 10^7 for the highest states. In the range of conditions studied it was independent of pressure at constant current.

MAP SHOWING TIME-ZONE BOUNDARIES

The standard time-zone boundaries for the United States with adjacent parts of Canada and Mexico, correct as of October 1, 1935, are shown on a map released last month by the Bureau.

This map, Miscellaneous Publication M155, is a revision of one published in 1930 which has been in wide demand by schools, colleges, radio broadcasting

stations, transportation agencies, hotels, manufacturers, and the general public. Educational institutions will find this publication useful as a companion to Circular C406, Standard Time Throughout the World, issued last year.

The base map was supplied by the U. S. Geological Survey, and the time-zone boundary lines were placed upon it as the result of information furnished by the Interstate Commerce Commission, the Hydrographic Office of the Navy Department, and the Dominion Observatory of Canada. The boundaries were drawn by R. E. Gould, chief of the Bureau's Time Section, and were checked by the Interstate Commerce Commission.

The map is printed in light blue on a white background. State boundaries and names, and the names of cities are in black. Time-zone boundary lines appear in red and each time zone is provided with a clock dial showing at a glance the difference in time between any two zones. The letters designating the zones and longitude west from Greenwich are in large, red block letters.

The dimensions of the map are 20 by 30 inches, and the paper, while light, is of good quality. Copies of the map are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

NEW AND REVISED PUBLICATIONS ISSUED DURING FEBRUARY 1936

Journal of Research¹

Journal of Research of the National Bureau of Standards, vol. 16, no. 2, February 1936 (RP858 to RP867, incl.). Price 25 cents. Obtainable by subscription.

Research Papers¹

[Reprints from the October, November, and December 1935 Journal of Research]

RP838. Atomic weight of gallium. G. E. F. Lundell and James I. Hoffman. Price 5 cents.

RP839. A study of the preparation of a specification for high-early-strength

portland cement. G. Rupert Gause. Price 5 cents.

RP842. The Waidner-Wolff and other adjustable electrical-resistance elements. E. F. Mueller and Frank Wenner. Price 5 cents.

RP845. Determination of magnetic hysteresis with the Fahy Simplex permeameter. Raymond L. Sanford and Evert G. Bennett. Price 5 cents.

RP846. Deterioration of vegetable-tanned leathers containing sulphuric acid and glucose. Everett L. Wallace and Joseph R. Kanagy. Price 5 cents.

RP847. The Priest-Lange reflectometer applied to nearly white porcelain enamels. Irwin G. Priest. Price 5 cents.

RP849. Apparatus and methods for investigating the chemical constitution of lubricating oil, and preliminary fractionation of the lubricating-oil fraction of a midcontinent petroleum. Beveridge J. Mair, Sylvester T. Schickanz, and Frank W. Rose, Jr. Price 5 cents.

RP851. Determination of principal stresses from strains on four intersecting gage lines 45° apart. Wm. R. Osgood. Price 5 cents.

RP852. Stability of aqueous solutions of acid potassium phthalate. James I. Hoffman. Price 5 cents.

RP853. Determination of gallium in aluminum. J. A. Scherrer. Price 5 cents.

RP854. Accelerated service tests of pintle bearings. Ambrose H. Stang and Leroy R. Sweetman. Price 5 cents.

RP855. Accelerated aging test for weighted silk. Wm. D. Appel and Daniel A. Jessup. Price 5 cents.

RP856. Unicontrol radio receiver for ultra high frequencies using concentric lines as interstage couplers. Francis W. Dunmore. Price 5 cents.

SIMPLIFIED PRACTICE RECOMMENDATIONS¹

R15-35. Blackboard slate. Price 5 cents.

R56-35. Carbon brushes (carbon, graphite, and metal-graphite) and brush shunts. Price 5 cents.

¹ Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, \$2.50 per year (United States and its possessions, Canada, Cuba, Mexico, Newfoundland, and the Republic of Panama); other countries, 70 cents and \$3.25, respectively.

¹ Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, \$2.50 per year (United States and its possessions, Canada, Cuba, Mexico, Newfoundland, and the Republic of Panama); other countries, 70 cents and \$3.25, respectively.

COMMERCIAL STANDARDS¹

CS53-35. Colors and finishes for cast stone. Price 5 cents.

MISCELLANEOUS PUBLICATION¹

M155. Standard time zones of the United States and adjacent parts of Canada and Mexico as of October 1, 1935. Price 10 cents.

TECHNICAL NEWS BULLETIN¹

Technical News Bulletin 226, February 1936. Price 5 cents. Obtainable by subscription.

LETTER CIRCULARS

It is the intent of the Bureau to distribute single copies of these Letter Circulars on request only to those parties having special interest in the individual Letter Circular. Economy necessitates limitation in the number of copies issued. It is not the intent to supply parties with a copy of each Letter Circular issued during the month. Letter Circulars are necessarily of a temporary nature designed to answer numerous inquiries on a given subject. Requests should be addressed to the National Bureau of Standards.

LC460. Tests of resistance apparatus. (Requirements and directions to be followed in submitting electrical resistance apparatus to the Bureau for test.)

LC461. Permanent magnet steel. (Summary of general principles involved in the manufacture and use of permanent magnets.)

¹ Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, \$2.50 per year (United States and its possessions, Canada, Cuba, Mexico, Newfoundland, and the Republic of Panama); other countries, 70 cents and \$3.25, respectively.

LC462. Sun lamps, health lamps, carbon and mercury arc lamps. (Statement by Bureau regarding such lamps.)

OUTSIDE PUBLICATIONS²

A new solar radio disturbance. J. H. Dellinger. Electronics (330 W. 42nd St., New York, N. Y.) 9, 25 (January 1936).

New cosmic phenomenon. J. H. Dellinger. QST (38 La Salle Road, West Hartford, Conn.) 20, 8 (January 1936).

The fireproofing of structural steel. S. H. Ingberg. Engineering and Contract Record (47 Adelaide St., West, Toronto 2, Canada) 49, 697 (Nov. 6, 1935), and Western Builder (407 E. Michigan St., Milwaukee, Wis.) 25, 2 (Dec. 5, 1935).

The presence of phosphorus in the sun. Charlotte E. Moore, Harold D. Babcock, and C. C. Kless. Astrophysical J. (Yerkes Observatory, Williams Bay, Wis.) 80, 59 (1934).

A procedure for the separation of the six platinum metals from one another and for their gravimetric determination. Raleigh Gilchrist and Edward Wichers. J. Am. Chem. Soc. (Mills Bldg., Washington, D. C.) 57, 2, 565 (1935).

Transparent plastics for aircraft windows. Gordon M. Kline. Modern Plastics (425 Fourth Ave., New York, N. Y.), 13, 17 (January 1936).

Large single crystals of copper (Simplified method for their preparation). J. G. Thompson. Metals and Alloys (1117 Wolfendale St., Pittsburgh, Pa.) 7, 19 (January 1936).

Observations on wiring practices abroad. M. G. Lloyd. Quar. Nat. Fire Protection Assn. (60 Battery-march St., Boston, Mass.) 29, 209 (January 1936).

² These publications are not obtainable from the Government. Requests should be sent direct to the publishers.

